

MEETING ABSTRACT

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Insect cell lines and baculoviruses as effective biocontrol agents of forest pests

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Background

Canada is a nation of trees. Canadian forests cover 50% of Canada's land area and represent 10% of world's forested area. Canada exports more processed forest products than any other country. It is also a host to a variety of forest insects both native and non native that limit the economic, recreational and wildlife habitat use. Our research focuses on initiating insect cell lines, determining nutritional requirements of cells, and developing low cost media for large scale propagation of insect pathogenic viruses as ecologically sound alternatives to chemical pesticides. Cell lines are used for bioassay and strain selection of viruses and bacterial toxins and for production of foreign gene products using baculovirus- and entomopoxvirus expression vectors. They offer a cleaner, viable alternative to insect larvae for producing viral pesticides.

Since 1969, over 150 continuous cell lines have been produced for forest insect pest research at GLFC. This collection represents one of largest single site repository of frozen insect cell lines in the world. Cell lines developed include tissues of the eastern spruce budworm (*Choristoneura fumiferana*), western spruce budworm (*Choristoneura occidentalis*), forest tent caterpillar (*Malacosoma disstria*), tobacco hornworm (*Manduca sexta*), white-marked tussock moth (*Orgyia leucostigma*), red-headed pine sawfly (*Neodiprion lecontei*), gypsy moth (*Lymantria dispar*), white pine weevil (*Pissodes strobi*), the tarnished plant bug (*Lygus lineolaris*) and the ash and privet borer (*Tylomatus bimaculatus*). These cell lines represent six tissues of origin, namely neonate larvae, pre-pupae, embryos, ovaries, hemocytes, and midgut and four Insect Orders namely Lepidoptera, Hymenoptera, Coleoptera and Hemiptera.

Presently, cell lines developed at GLFC are being used by 41 researchers in 8 Canadian provinces, 42 researchers in 21 US States and 28 researchers in 12 countries worldwide.

Biological control

Although chemical pesticides are generally more reliable and effective control agents, they are not environmentally acceptable as their negative impact far out weigh their benefits. We have developed methodologies to duplicate the *in vivo* process of the insect by producing both baculovirus phenotypes, the occlusion derived virus (ODV) and the budded virus (BV) *in vitro*. During the *in vivo* infection process hemolymph (BV) is collected and cultures are infected producing both phenotypes. BV, released in the media is used to infect other cells; ODV produced in the nuclei to infect other insects.

Lawn assay

Trees produce numerous compounds with toxic and growth regulating properties to protect themselves against insect attack. We have developed a rapid *in vitro* agarose lawn assay for testing the toxicity of freeze-dried ethanolic leaf extracts and secondary compounds. Foliage from sugar maple, trembling aspen and mulberry was assayed for possible insecticidal properties against cells from two lepidopteran defoliators, spruce budworm and fall armyworm. Cells were suspended in buffered agarose and spread in a petri dish. Leaf extracts solubilized in 50-70% DMSO were applied directly to the cells. Trypan blue staining was used as an indicator of toxicity. Quantitative comparisons were determined by threshold doses that elicited positive responses. Toxicity and validity of the assay were further confirmed by the presence of membrane disruption and cellular lysis. The activity of trembling aspen was markedly enhanced when the pH was raised from 7 to 10.5, a level similar

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Baculoviruses For Insect Pest Control Safety Considerations

Daniela Niemeyer



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Baculoviruses for Insect Pest Control Max Summers, 1975 *Baculoviruses for Insect Pest Control* Max Summers, 1975

Biological and Biotechnological Control of Insect Pests Jack E. Rechcigl, Nancy A. Rechcigl, 1999-09-24 Pest and disease management continues to challenge the agricultural community The rise in new pest and crop problems juxtaposed with public concern over pesticide use and more stringent environmental regulations creates the need for today's agricultural producers to stay current with new technologies for producing quality crops profitably Biological and Biotechnological Control of Insect Pests presents an overview of alternative measures to traditional pest management practices utilizing biological control and biotechnology The removal of some highly effective broad spectrum chemicals caused by concerns over environmental health and public safety has resulted in the development of alternative reduced risk crop protection products These products less toxic to the environment and easily integrated into biological control systems target specific life stages or pest species Predation recognized as a suitable long term strategy effectively suppresses pests in biotechnological control systems Biological and Biotechnological Control of Insect Pests covers these topics and more It explores the current approaches in alternative solutions such as biological control agents parasites and predators pathogenic microorganisms pheromones botanical insecticides genetic control genetic engineering of plants and biocontrol agents and government regulations for biocontrol agents and recombinant DNA technology This book will be a useful resource to entomologists agronomists horticulturists and environmental scientists *Viruses and Environment* Edouard Kurstak, 2012-12-02 Viruses and Environment contains the proceedings of the Third International Conference on Comparative Virology held at Mont Gabriel Quebec Canada on May 1977 The primary focus of the conference is the ecology of viruses that is the interrelationships between organisms and their environment Organized into seven parts with a total of 33 chapters this book centers on the impact of viruses on the environment the persistent virus infections of man vertebrate and invertebrate animals and plants and the smallest disease agents the viroids In particular this book describes the reservoirs of viruses such as arthropod vectors water cultivated plants and wild animals safety considerations concerning the use of live virus vaccines and the viral insecticides The use of bacterial viruses in genetic engineering is also addressed This treatise will be valuable to research workers in medical and biomedical fields biological control and animal and plant quarantine It will also benefit the university teachers and graduate students **Advances in Microbial Control of Insect Pests** Rajeev K.

Upadhyay, 2013-04-17 The insect 1 remain in symbiotic associations with a tremendous number of microorganisms and some of them could be classified as parasitic pathogenic Without question insect pathogens act as natural mortality agents and represent the third leg of the triad of biological control which is an environmentally sound alternative to chemical control The virulence and pathogenicity of an insect parasite i.e. disease agent are determined by the microbial genome as a result of the coordinated expression of a concert of genes These genes may be organized as cassettes and be associated with

transmissible DNA The acquisition of these domains or pathogenicity islands may be sufficient to develop a transgenic virulent pathogen The insect pathogens are very specific and this property can be exploited in making insects sick However rarely have field applications of highly virulent strains of viruses fungi bacteria protozoa resulted in massive insect population reductions or induced widespread persistent epizootics as the same is also governed by host susceptibility regulated by genetics age sex and physiological state of the host Insect pathogens causing acute or chronic diseases must be able to persist in the environment to multiply in the host and to spread to other susceptible hosts In this book I have attempted to bring together all recent studies regarding both fundamental and more applied research aspects related to entomopathogens bacteria viruses fungi and nematodes in order to facilitate their development and commercial exploitation

Selected References on Environmental Quality as it Relates to Health ,1976 Monthly Bibliography of MEDLARS based journal articles that describe perturbations in the ecosystems important to health For the most part genetic and clinical literature not included Index medicus format author subject sections Cumulated Index Medicus ,1976

Technical Bulletin ,1981 **Biocontrol of Lepidopteran Pests** K. Sowjanya Sree,Ajit Varma,2015-02-17 This volume describes the various applications of entomopathogenic soil microorganisms in the management and control of the devastating lepidopteran pest An introduction describes the insecticidal properties of viruses bacteria fungi nematodes and their metabolites as well as their applications in the context of crop improvement Subsequent chapters focus on topics such as insecticidal proteins the role of nucleopolyhedroviruses Bt toxins and their receptors control of lepidopterans using entomopathogenic fungi management of cotton defoliators and sustainable use of entomopathogenic nematodes and their bacterial symbionts An overview of culture collections of entomopathogenic microorganisms rounds out the volume

Current Bibliography of Epidemiology ,1972 **Peroral Bioassay of Technical-grade Preparations of the Douglas-fir Tussock Moth Nucleopolyhedrosis Virus (Baculovirus)** Mauro E. Martignoni,Paul J. Iwai,1977 USDA Forest Service Research Paper PNW. ,1976 **The Baculoviruses** Lois K. Miller,2013-06-29 The past decade has witnessed an explosion of information on the molecular biology of insect viruses and a frenzy of activity in applying this information to medicine and agriculture Genetically engineered baculoviruses are presently being tested for commercial use as pesticides and the study of such viruses is also revealing remarkable insights into basic cellular processes such as apoptosis This comprehensive volume provides readers with knowledge of basic and applied baculovirology so that current literature in the field can be appreciated *Guide to Sources for Agricultural and Biological Research* J. Richard Blanchard,Lois Farrell,2023-07-28 *Baculovirus Expression Vectors* David R. O'Reilly,Lois K. Miller,Verne A. Luckow,1994 Baculoviruses have proven to be the most powerful and versatile eukaryotic expression vectors available This unique laboratory manual is designed to help both beginning and experienced researchers construct and use baculovirus vector systems It simplifies selection of the most appropriate baculovirus vector design for a given problem then describes each step of the

implementation process from vector construction to large scale protein production The book provides an understanding of how the vectors work a biological overview of cells viruses plasmids and promoters guidelines for choosing optimum vectors protocols for growing insect cells and recombinant viruses methods of analyzing protein products and scaling up protein production techniques for producing proteins in insect larvae and easy to use maps charting available expression vectors This comprehensive approach has many benefits for researchers and students alike It allows them to understand how and why the vector system works and offers a rapid comparison of options for choosing the right virus plasmid or promoter for vector design and construction with a minimum amount of lost time The manual is an invaluable resource for every individual engaged in the production of proteins for any purpose Epizootiology of Insect Diseases James R. Fuxa, Yoshinori Tanada, 1991-01-16 The first book devoted to the epidemiology or epizootiology of insect pathogens Covers all aspects of the subject including general principles concepts and definitions strategies and methods for research modeling factors that influence epizootics area wide patterns of disease all the groups of disease and practical aspects such as enhancing disease in pest species controlling it in beneficial insects or in insect rearing Provides material not readily found elsewhere such as modeling entomopathogen epizootics general reviews of the epizootiology of various pathogen groups consideration of microbial control from an epizootiological point of view and a general review of epizootiology in prevention of insect disease Offers the most comprehensive bibliography of this subject anywhere Well illustrated Advances in Virus Research , 1978-04-27 Advances in Virus Research **Agriculture and Related Agencies Appropriations Bill ...** United States. Congress. House. Committee on Appropriations, 1978 **Agricultural programs** United States. Congress. House. Committee on Appropriations. Subcommittee on Agriculture and Related Agencies, 1977 *Bibliography of Agriculture with Subject Index* , 1976-07

The Enigmatic Realm of **Baculoviruses For Insect Pest Control Safety Considerations**: Unleashing the Language is Inner Magic

In a fast-paced digital era where connections and knowledge intertwine, the enigmatic realm of language reveals its inherent magic. Its capacity to stir emotions, ignite contemplation, and catalyze profound transformations is nothing short of extraordinary. Within the captivating pages of **Baculoviruses For Insect Pest Control Safety Considerations** a literary masterpiece penned by a renowned author, readers attempt a transformative journey, unlocking the secrets and untapped potential embedded within each word. In this evaluation, we shall explore the book's core themes, assess its distinct writing style, and delve into its lasting affect the hearts and minds of those that partake in its reading experience.

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